CLAIMS

We claim:

1. Apparatus comprising:

a locking bolt work apparatus enabling selective securing of a door, including:

an elongated locking bolt movably mounted relative to a door, wherein the locking bolt is operative to move between an extended position and a retracted position;

a drive cam rotatably mounted in supporting connection with the door adjacent to a first end portion of the locking bolt;

an idler cam rotatably mounted in supporting connection with the door adjacent to a second end portion of the locking bolt;

a cam link operatively extending between the drive cam and the idler cam;

a first bolt link operatively extending between the drive cam and the locking bolt;

a second bolt link operatively extending between the idler cam and the locking bolt;

wherein rotational movement of the drive cam between a first position and a second position moves the locking bolt between the extended position and the retracted position, respectively.

2. The apparatus according to claim 1 and further comprising a first connector, wherein the first connector operatively connects the drive cam and the first bolt link and the cam link, and wherein rotational movement of the drive cam is operative to move the first bolt link and the cam link.

3. The apparatus according to claim 2 and further comprising a retainer, wherein the retainer is engaged with the drive cam, and wherein the retainer is operative to retain the operative connection of the drive cam and the first bolt link and the cam link.

4. The apparatus according to claim 3 wherein the first bolt link and the cam link are intermediate the drive cam and the retainer adjacent the connection of the drive cam and the first bolt link and the cam link.

5. The apparatus according to claim 3 wherein the retainer is engaged with the drive cam at a location disposed from the connection of the drive cam and the first bolt link and the cam link.

6. The apparatus according to claim 5 wherein the drive cam includes a cut out, wherein a portion of the retainer extends into the cut out, and wherein the retainer is substantially prevented from rotating relative to the drive cam.

7. The apparatus according to claim 5 wherein the drive cam and the first bolt link and the cam link are removably connected, and wherein the engaged retainer is operative to prevent disconnection of the drive cam and the first bolt link and the cam link.

8. The apparatus according to claim 3 wherein the first connector comprises a shaft, and wherein the drive cam and the first bolt link and the cam link are rotatable on the shaft.

9. The apparatus according to claim 8 wherein the first connector comprises a dowel pin.

10. The apparatus according to claim 8 wherein the first bolt link is operatively engaged with the locking bolt, and wherein the engaged retainer is operative to prevent disengagement of the first bolt link and the locking bolt.

11. The apparatus according to claim 3 and further comprising a second connector, wherein the second connector operatively connects the idler cam and the second bolt link and the cam link.

12. The apparatus according to claim 11 and further comprising a keeper, wherein the keeper is engaged with the idler cam, and wherein the keeper is operative to retain operative connection of the idler cam and the second bolt link and the cam link.

13. The apparatus according to claim 12 wherein the second bolt link and the cam link are intermediate the idler cam and the keeper adjacent the connection of the idler cam and the second bolt link and the cam link.

14. The apparatus according to claim 12 wherein the keeper is engaged with the idler cam at a location disposed from the connection.

15. The apparatus according to claim 14 wherein the idler cam and the second bolt link and the cam link are removably connected, and wherein the engaged keeper is operative to prevent disconnection of the idler cam and the second bolt link and the cam link.

16. The apparatus according to claim 14 wherein the keeper is operatively connected with the idler cam at plural locations disposed from the connection.

17. The apparatus according to claim 12 wherein the second connector comprises a shaft, and wherein the idler cam and the second bolt link and the cam link are rotatable on the shaft.

18. The apparatus according to claim 17 wherein the second bolt link is operatively engaged with the locking bolt, and wherein the engaged keeper is operative to prevent disengagement of the second bolt link and the locking bolt.

19. The apparatus according to claim 1 and further comprising

a lock operatively engageable with the drive cam, wherein the drive cam is movable when the lock is in an unlocked condition, and wherein the drive cam is operative to be held stationary by operative engagement with the lock when the lock is in a locked condition,

an alignment device, wherein the alignment device is operative to align the drive cam with the lock to enable locking of the drive cam.

20. The apparatus according to claim 19 wherein the alignment device is operative to stop rotation of the drive cam at an angular position in a first rotational direction, and wherein the alignment device is adjustable to permit the angular position to be adjusted.

21. The apparatus according to claim 20 wherein the alignment device has an adjustable length, and wherein the length of the alignment device corresponds to the permitted angular position of the drive cam.

22. The apparatus according to claim 1 wherein the locking bolt comprise first and second openings, wherein the first bolt link extends in and is removably engaged with the first opening, and wherein the second bolt link extends in and is removably engaged with the second opening.

23. The apparatus according to claim 1 wherein the locking bolt comprise plural stud openings, wherein each stud opening comprises a wide portion and a narrower neck portion.

24. The apparatus according to claim 23 further comprising plural studs fixedly mounted to the door, wherein the locking bolt is supported by the door, wherein each stud comprises a head and a narrower neck portion, wherein each stud head is able to pass through the wide portion of a stud opening but unable to pass through the neck portion of the stud opening.

25. The apparatus according to claim 1 wherein the cam link has a first end and a second end, wherein the cam link has substantially flat sides extending from the first end to the second end.

26. The apparatus according to claim 1 wherein the cam link has a wavy configuration taken in cross section.

27. The apparatus according to claim 1

wherein the locking bolt comprise plural openings, and wherein each opening comprises a first portion and a second portion;

a lock operatively engageable with the drive cam, wherein the drive cam is movable when the lock is in an unlocked condition, and wherein the drive cam is operative to be held stationary by operative engagement with the lock when the lock is in a locked condition;

plural studs fixedly mounted to the door, wherein each stud comprises a stud head, wherein each stud head is able to pass through the first portion of a locking bolt opening but unable to pass through the second portion of the locking bolt

opening, and wherein the locking bolt is operatively supported by at least one of the studs;

a first retainer removably fastened to the drive cam;

a second retainer removably fastened to the idler cam;

wherein the drive cam and the first bolt link and the cam link are removably connected, wherein the first retainer is operative to prevent disconnection of the drive cam and the first bolt link and the cam link;

wherein the idler cam and the second bolt link and the cam link are removably connected, wherein the second retainer is operative to prevent disconnection of the idler cam and the second bolt link and the cam link.

28. The apparatus according to claim 27 wherein the first bolt link is operatively connected to the locking bolt, and wherein the second bolt link is operatively connected to the locking bolt.

29. The apparatus according to claim 27

wherein the locking bolt comprise plural holes;

wherein the first bolt link extends into a first locking bolt hole and is operatively engaged with the locking bolt, and wherein the first retainer is operative to prevent disengagement of the first bolt link and the locking bolt;

wherein the second bolt link extends into a second locking bolt hole and is operatively engaged with the locking bolt, and wherein the second retainer is operative to prevent disengagement of the second bolt link and the locking bolt.

30. Apparatus comprising:

a locking bolt work apparatus enabling selective securing of a door, including:

an elongated locking bolt movably mounted relative to a door, the locking bolt movable between extended and retracted positions;

a drive cam rotatably mounted in supporting connection with the door adjacent to a first end portion of the locking bolt;

an idler cam rotatably mounted in supporting connection with the door adjacent to a second end portion of the locking bolt;

a cam link operatively extending between the drive cam and the idler cam;

a first bolt link operatively extending between the drive cam and the locking bolt;

a second bolt link operatively extending between the idler cam and the locking bolt;

wherein rotational movement of the drive cam between a first position and a second position moves the locking bolt between the extended position and the retracted position, respectively;

a door handle assembly, including:

a sleeve,

wherein the sleeve is attached to the door adjacent a door hole,

wherein the sleeve includes a tapered inner surface,

a handle shaft,

wherein the handle shaft includes a tapered outer surface,

a handle lever,

wherein the inner surface is operative to engage the outer surface to prevent removal of the handle shaft through the door hole in a direction away from the handle lever.

31. Apparatus comprising:

a door handle assembly, including:

a sleeve,

wherein the sleeve is attachable to a door adjacent a door hole,

wherein the sleeve includes a tapered inner surface,

a handle shaft,

wherein the handle shaft includes a tapered outer surface,

a handle lever,

wherein the inner surface is operative to engage the outer surface to prevent removal of the handle shaft through the door hole in a direction away from the handle lever.

32. The apparatus according to claim 31 wherein the sleeve is operative to be substantially located on an opposite side of the door from the handle lever when in engagement with the handle shaft.

33. The apparatus according to claim 32 wherein the sleeve includes a ledge, wherein the ledge is operative to prevent passage of the sleeve through the door hole.

34. The apparatus according to claim 32 wherein the handle shaft comprises an axis, wherein the sleeve includes non tapered inner surface sections extending in the axial direction, wherein the handle shaft includes non tapered outer surface sections extending in the axial direction, wherein the sleeve sections are operative to respectively substantially correspond to the handle shaft sections to align the handle shaft.